

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

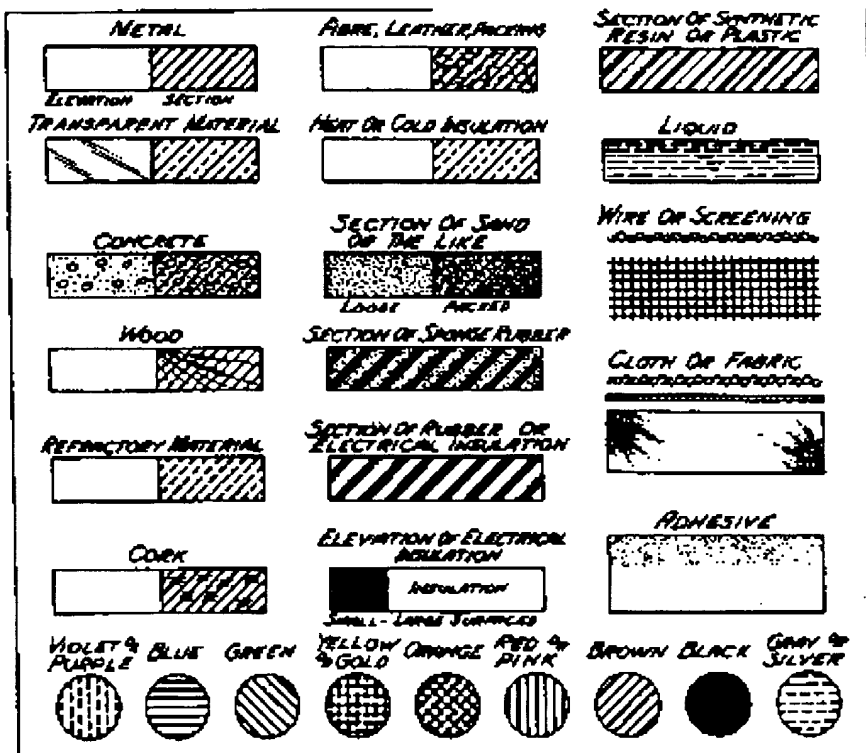
The following title is suggested: "Infrared Radiator With Carbon Fiber Heating Element Centered By Spacers."

The disclosure is objected to because of the following informalities:

Headings must be provided for each respective section of the specification (e.g., "BACKGROUND OF THE INVENTION", "BRIEF SUMMARY OF THE INVENTION", "BRIEF DESCRIPTION OF THE DRAWINGS", "DETAILED DESCRIPTION OF THE INVENTION", etc.).

The drawings are objected to because of the following informalities:

Fig. 1-8, and 15: Proper cross-sectional hatching is required to properly denote metallic, transparent, and insulative materials in accordance with MPEP 608.02 (see the drawing below for proper hatching examples). Moreover, all structures denoted by a darkened single line must be given a thickness and appropriately hatched in cross section for clarity.



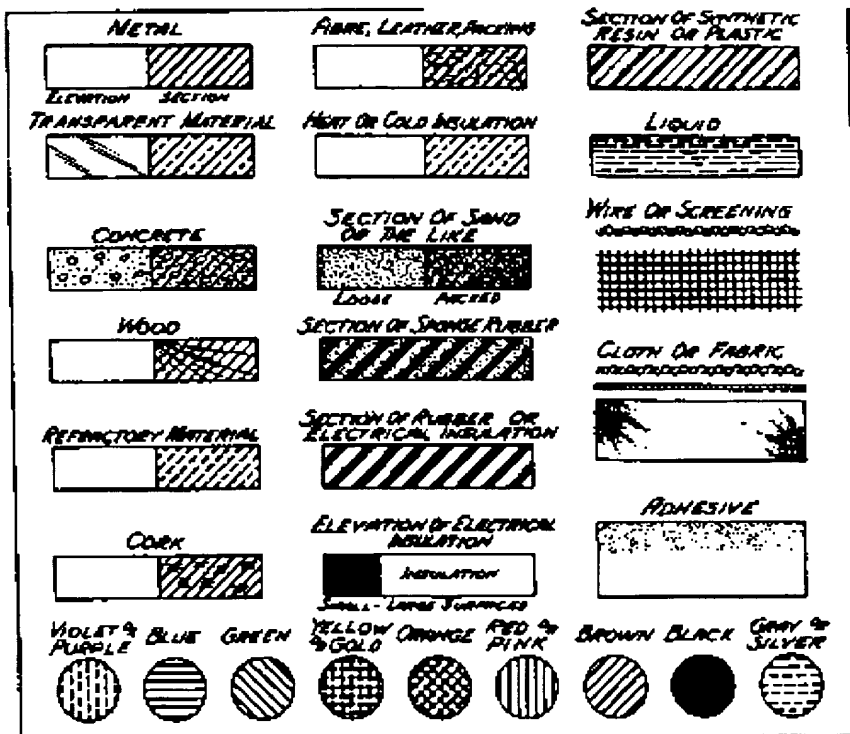


Fig. 14: The cross section designation "A-A" must be changed to "15-15" for proper format. Applicant is reminded to amend the specification accordingly in conjunction with the drawing change.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the metallic coating applied to the ends of the heating element as claimed in claims 28-30 must be shown or the feature should be cancelled from the claims. **An enlarged cross section with proper metallic hatching clearly showing the coating is required for this feature.** Applicant is reminded to amend the specification accordingly in conjunction with the addition of the new figures. No new matter should be entered.

The response to this action must include a separate letter addressed to the examiner and contain: (1) sketches showing in red the drawing changes required above and (2) a request that the examiner approve the changes as shown on the sketches.

**IMPORTANT NOTE:** The filing of new formal drawings to correct the noted defect may be deferred until the application is allowed by the examiner, but the print or pen-and-ink sketches with proposed corrections in red ink is required in response to this office action, and may not be deferred.

Claim 23 is objected to because of the following informalities:

In line 1, the comma must be deleted.

Appropriate correction is required.

Claims 17-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17: In line 2, "with its ends" is vague and indefinite as to which structure "its" refers to. Accordingly, "with its ends" must be changed to "the ends of said heating element" for clarity.

Claim 21: In line 3, no antecedent basis exists for "the coils of the heating element" because claim 17 from which claim 21 depends did not recite the heating element as being coiled. For purposes of examination, the examiner presumes the claim was intended to depend from claim 18.

Claims 22, 27, and 32: A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, (1) claim 22 recites the broad recitation "ceramic," and the claim also recites "especially aluminum oxide or zirconium oxide" which is the narrower statement of the range/limitation, (2) claim 27 recites the broad recitation "graphite," and the claim also recites "especially as graphite paper" which is the narrower statement of the range/limitation, and (3) claim 32 recites the broad recitation "temperature greater than 1000°C," and the claim also recites "preferably greater than 1500°C" which is the narrower statement of the range/limitation.

Claim 24: No antecedent basis exists for "the resilient material."

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 17, 23-27, and 32 are rejected under 35 USC 102(b) as being anticipated by Dexter et al (US6057532). Note carbon fiber heating element 2 centered in the quartz tube by means of spacers 44. See Figs. 24 and 25. Also, according to col. 1, lines 17-21, the heater is designed to operate up to a temperature of 1800 °C.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103, the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligations under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 18-20 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter et al (US6057532) in view of DE19839457 or JP53-102976. The claims differ from the previously cited prior art in calling for the carbon fiber heating element to be coiled. Coiling a carbon fiber heating element for use in an infrared heater is conventional and well known in the art as evidenced by either DE19839457 who in Fig. 1 discloses coiling a carbon fiber heating element as well as JP53-102976 who in Figs. 1-4 teaches coiling a carbon fiber heating element in an infrared heater. As is well known in the art, coiling an electric heating element has numerous advantages in terms of heating efficiency and structural integrity over heating elements that are not coiled including (1) maximizing heating element surface area per unit length by using more resistive material per unit length, and (2) inherently accommodating for thermal expansion via the coil structure itself thereby compensating for thermal expansion and contraction thus minimizing stress on the heater during heat-up and cool-down. In

view of either DE19839457 or JP53-102976, it would have been obvious to one of ordinary skill in the art to provide a carbon fiber coil in lieu of the straight carbon fiber heating element of Dexter et al (US6057532) in order to (1) maximize heating element surface area per unit length by using more resistive material per unit length, and (2) accommodate for thermal expansion via the coil structure itself thereby compensating for thermal expansion and contraction thus minimizing stress on the heater during heat-up and cool-down. With regard to claim 31, even though the claims are limited by and defined by the recited process, the determination of patentability of the product is based on the product itself, and does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter et al (US6057532) in view of DE19839457 or JP53-102976 and further in view of Brundige et al (US2980820). The claims differ from the previously cited prior art in calling for the spacers to have a longitudinal length greater than the distance between the coils of the heating element. Providing spacers with such a dimension in an infrared heater with a coiled heating element is conventional and well known in the art as evidenced by Brundige et al (US2980820) noting Col. 3, lines 12-24 wherein spacers 20 are designed such that the minimum thickness thereof is greater than the spacing between turns of the heating element, thus spreading the turns of the heating element apart thereby elastically gripping and firmly clamping the spacer. In view of Brundige et al (US2980820), it would have been obvious to one of ordinary skill in the art to utilize a spacer similar to Brundige et al (US2980820) and dimension the spacer having a length greater than the distance between coils in the previously described apparatus thereby spreading the turns of the heating element apart thereby elastically gripping and firmly clamping the spacer.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter et al (US6057532) in view of GB864318. The claims differ from the previously cited prior art in calling for aluminum oxide or zirconium dioxide to be arranged between the heating element and the spacers. Providing alumina material in conjunction with a heating element spacer in an infrared heater is conventional and well known in the art as evidenced by GB864318 noting alumina section 15 in conjunction with molybdenum or tantalum section 13 in Fig. 2. Such an arrangement firmly centers the heating element and is highly resistant to thermal shock due to elevated temperatures. In view of GB864318, it would have been obvious to one of ordinary skill in the art to provide ceramic/tantalum material spacers in lieu of the spacers of the previously described apparatus so that the

spacers firmly held the heating element in the center and were also resistant the thermal shock. While the alumina is not disposed between the heating element and the spacers, reversing the alumina and tantalum materials such that the alumina contacts the electric heating element is a mere reversal of parts. It is well settled that a mere reversal of apparatus parts is within the level of one of ordinary skill in the art. In re Gazda, 219 F.2d 449, 104 USPQ 400 (CCPA 1955).

Claims 17-20, 23-27, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brundige et al (US2980820) in view of Dexter et al (US6057532). Brundige et al (US2980820) discloses an infrared heater with spacers centering the coiled heating element within a quartz tube. The claims differ from the previously cited prior art in calling for the heating element to be a carbon fiber heating element. Providing carbon fiber heating element in lieu of a tungsten heating element in an infrared heater is conventional and well known in the art as evidenced by Dexter et al (US6057532) noting Col. 1, lines 25-34 wherein the use of carbon fiber heating elements in lieu of other types of materials (1) allows the use of a more flexible heater and avoids the brittleness of the more difficult to handle prior art materials, and (2) provides a more stable electrical resistance value at elevated temperatures. In view of Dexter et al (US6057532), it would have been obvious to one of ordinary skill in the art to use carbon fiber heating elements in lieu of the heating element of Brundige et al (US2980820) in order to (1) allow the use of a more flexible heater and avoids the brittleness of the more difficult to handle prior art materials, and (2) provide a more stable electrical resistance value at elevated temperatures. With regard to claim 31, even though the claims are limited by and defined by the recited process, the determination of patentability of the product is based on the product itself, and does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985).

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brundige et al (US2980820) in view of Dexter et al (US6057532) and further in view of GB864318. The claims differ from the previously cited prior art in calling for aluminum oxide or zirconium dioxide to be arranged between the heating element and the spacers. Providing alumina material in conjunction with a heating element spacer in an infrared heater is conventional and well known in the art as evidenced by GB864318 noting alumina section 15 in conjunction with molybdenum or tantalum section 13 in Fig. 2. Such an arrangement firmly centers the heating element and is highly resistant to thermal shock due to elevated temperatures. In view of GB864318, it would have been obvious to one

of ordinary skill in the art to provide ceramic/tantalum material spacers in lieu of the spacers of the previously described apparatus so that the spacers firmly held the heating element in the center and were also resistant the thermal shock. While the alumina is not disposed between the heating element and the spacers, reversing the alumina and tantalum materials such that the alumina contacts the electric heating element is a mere reversal of parts. It is well settled that a mere reversal of apparatus parts is within the level of one of ordinary skill in the art. In re Gazda, 219 F.2d 449, 104 USPQ 400 (CCPA 1955).

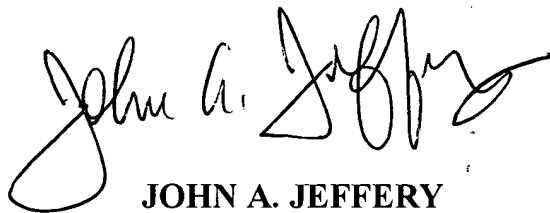
Claims 28-30 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112 and to include all of the limitations of the base claim and any intervening claims.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art should be both separately considered and considered in conjunction with the previously cited prior art when responding to this action.

US 137, SU 918, DE 870 disclose IR heaters with carbon fiber heating elements. US 277, US 758, US 875, JP 981, US 605 disclose IR heaters with centering spacers for the heating element. US 310, DE 785, US 438 disclose terminal details for infrared heaters relevant to the instant invention.

Any inquiry concerning this or earlier communications from the examiner should be directed to John A. Jeffery at telephone number (703) 306-4601 or fax (703) 305-3463. The examiner can normally be reached on Monday-Thursday from 7:00 AM to 4:30 PM EST. The examiner can also be reached on alternate Fridays.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0861.



**JOHN A. JEFFERY**  
**PRIMARY EXAMINER**

11/15/01